Table 2 | **Critical phase 1-specific transcription factor genes in murine early T cells and their progenitors**

Gene (protein)	Protein family	Knockout phenotype	Overexpression phenotype	Selected References
Lmo2	LIM	• Severe stem cell defects • No T cell effects if deleted after DN2 stage	T-ALL	1–4
Gata2	GATA ZnF	Early stem cell defects	Unknown	5,6
Mef2c	MADS-box	T cell, B cell and NK cell defects	• AML • T-ALL association	7,8
Meis1	MEIS homeodomain	Early stem cell defects	AML association	9–11
Hoxa9	HOX homeobox	• Defect in HSC proliferation • Partial DN2 stage block	AML	11–14
Tal1	TAL bHLH	Early stem cell defects	T-ALL	15,16
Gfi1b	• SNAG • C2H2-like ZnF	HSC proliferative expansion	Unknown	17
Lyl1	TAL bHLH	Defects in LMPPs, ETPs and DN2a cells	• B-ALL • T-ALL	18–20
Spi1 (PU.1)	ETS	• Absence of T cell and NK cell development • AML	• Diversion to DC or myeloid cell lineages • T cell lymphoma	21–25 (reviewed in 26)
Bcl11a	ZnF C2H2-like	Required for B, T and NK cell development	Myeloid and B cell malignancies	6,27–30
Hhex	Homeobox	Impaired monocyte development	T-ALL	2,3,32
Mycn	MYC bHLH	Defects in HSC survival and proliferation (with C-MYC)	AML	33,34
Erg	ETS	Early stem cell defects	T-ALL and other leukaemias	35,36

AML, acute myeloid leukaemia; B-ALL, B cell acute lymphoblastic leukaemia; bHLH, basic helix–loop–helix; *Bcl11a*, B cell lymphoma–leukaemia 11A; C2H2, a form of zinc finger (Cys_2His_2); DC, dendritic cell; DN, double negative; ETP, early thymic progenitor; ETS, E26 transformation-specific; *Gata2*, GATA-binding protein 2; *Gfi1b*, growth factor-independent protein 1B; *Hhex*, haematopoietically expressed homeobox protein; *Hoxa9*, homeobox A9; HSC, haematopoietic stem cell; *Lmo2*, LIM domain only 2; LMPP, lymphoid-primed multipotent precursor; *Lyl1*, lymphoblastic leukaemia 1; *Mef2c*, myocyte enhancer factor 2C; *Meis1*, Meis homeobox 1; NK, natural killer; SNAG, Snail/Gfi1 domain (a repression domain); *Tal1*, gene encoding T-ALL protein 1 (also known as SCL); T-ALL, T cell acute lymphoblastic leukaemia; ZnF, zinc finger.

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